CLAIMS

What is claimed is:

1. A method for determining gas exchange efficiencies of volumetric portions of and the volume of the lungs of a subject to express ventilation homogeneity characteristics of volumetric portions of the lungs, said method comprising the steps of:

(a) allowing the patient to breath with breathing gases having given properties regarding the amount of an inert gas contained therein;

(b) ascertaining the concentration F_o of the inert gas in the lungs of the subject;

(c) altering the amount of the inert gas in the breathing gases provided to the subject;

(d) causing the subject to breath breathing gases having the altered amount of the inert gas;

(e) thereafter measuring the change in volume ΔV_{ig} of the inert gas in the lungs of the subject and the concentration F of inert gas in the lungs of the subject for each breath;

(f) making a determination of the lung volume V of the subject using a summation of the volume change ΔV_{ig} of the inert gas in the lungs of the subject, the concentration F of the inert gas in the lungs of the subject, and the amount F_o of the inert gas in the breathing gases ascertained in step (b);

(g) obtaining a measure of the gas exchange efficiency of the subject's lungs using the breathing gas volume V_A of the subject and the lung volume V determined in step (f);

(h) repeating step (e) and, respectively, steps (f) and (g) for a subsequent breath of the subject to make at least one further determination of the lung volume V of the subject and obtain at least one further gas exchange efficiency measure;

(i) forming a lung volume V data series comprising the volumes V determined for each breath and, respectively, a gas exchange efficiency data series comprising gas exchange efficiencies obtained for each breath; and

(j) expressing the ventilation homogeneity of volumetric portions of the lungs of the subject by relating the series of gas exchange efficiencies to the lung volume series.

2. The method according to claim 1wherein step (e) is further defined as measuring the concentration F of the inert gas in the lungs of the subject using end tidal inert gas concentrations of the subject.

3. The method according to claim 1 wherein step (g) is further defined as obtaining a gas exchange efficiency measure comprising a dilution ratio for the amount of inert gas F_o in the breathing gases.

4. The method according to claim 1 wherein step (j) is further defined as carrying out the expression graphically by plotting one data series on an abscissa of a graph and the other data series on an ordinate of a graph.

5. The method according to claim 1 wherein step (h) is further defined as making a plurality of further determinations of lung volume V and as obtaining a plurality of further gas exchange efficiency measures.

6. The method according to claim 1 further including the step (j) of normalizing the further gas exchange efficiency measure obtained in step (h) using the measured gas exchange efficiency measure obtained in step (g) for a first breath of the subject after altering the amount of inert gas in the breathing gases provided to the subject.

7. The method according to claim 5 further including the step (j) of normalizing the further gas exchange efficiency measure obtained in step (h) using the measured gas exchange efficiency measure obtained in step (g) for a first breath of the subject after altering the amount of inert gas in the breathing gases provided to the subject.